

What is claimed is:

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1. A cobalt-nickel-iron alloy thin film containing 60 to 75 weight % cobalt, 10 to 20 weight % nickel, and 10 to 20 weight % iron and having a crystal structure that is a mixture 5 of a body-centered cubic structure phase and a face-centered cubic structure phase, wherein  $I_b/I_f$  is in the range of 0.3 to 0.7 inclusive where  $I_b$  represents the intensity of an X-ray diffracted from a (110)-plane of the body-centered cubic structure and  $I_f$  represents the intensity of an X-ray 10 diffracted from a (111)-plane of the face-centered cubic structure.

2. A method of forming a cobalt-nickel-iron alloy thin film containing 60 to 75 weight % cobalt, 10 to 20 weight % 15 nickel, and 10 to 20 weight % iron, and having a crystal structure that is a mixture of a body-centered cubic structure phase and a face-centered cubic structure phase through electroplating,

wherein the cobalt-nickel-iron alloy thin film is formed 20 such that  $I_b/I_f$  falls within the range of 0.3 to 0.7 inclusive where  $I_b$  represents the intensity of an X-ray diffracted from a (110)-plane of the body-centered cubic structure and  $I_f$  represents the intensity of an X-ray diffracted from a (111) plane of the face-centered cubic structure.

film according to claim 2, wherein the pH of a plating bath for forming the cobalt-nickel-iron alloy thin film through electroplating is adjusted to 3.0 to 4.0 inclusive.

5        4. A method of forming a cobalt-nickel-iron alloy thin film according to claim 3, wherein the value of  $I_b/I_f$  is controlled by controlling the pH of the plating bath.

10        5. A thin-film magnetic head comprising:  
a medium facing surface that faces toward a recording  
medium;  
a first magnetic layer and a second magnetic layer  
magnetically coupled to each other and including magnetic pole  
portions that are opposed to each other and placed in regions  
15        of the magnetic layers on a side of the medium facing surface,  
each of the magnetic layers including at least one layer;  
a gap layer provided between the magnetic pole portions  
of the first and second magnetic layers; and  
a thin-film coil at least a part of which is placed between  
20        the first and second magnetic layers, the at least part of the  
coil being insulated from the first and second magnetic layers,  
wherein:  
at least either of the first and second magnetic layers  
includes a part made of a cobalt-nickel-iron alloy thin film;  
25        and  
the cobalt-nickel-iron alloy thin film contains 60 to 75

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weight % cobalt, 10 to 20 weight % nickel, and 10 to 20 weight % iron, and has a crystal structure that is a mixture of a body-centered cubic structure phase and a face-centered cubic structure phase, in which  $I_b/I_f$  is in the range of 0.3 to 0.7 inclusive where  $I_b$  represents the intensity of an X-ray diffracted from a (110)-plane of the body-centered cubic structure and  $I_f$  represents the intensity of an X-ray diffracted from a (111)-plane of the face-centered cubic structure.

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6. A method of manufacturing a thin-film magnetic head comprising: a medium facing surface that faces toward a recording medium; a first magnetic layer and a second magnetic layer magnetically coupled to each other and including magnetic pole portions that are opposed to each other and placed in regions of the magnetic layers on a side of the medium facing surface, each of the magnetic layers including at least one layer; a gap layer provided between the magnetic pole portions of the first and second magnetic layers; and a thin-film coil 15 at least a part of which is placed between the first and second magnetic layers, the at least part of the coil being insulating from the first and second magnetic layers, wherein at least either of the first and second magnetic layers includes a part made of a cobalt-nickel-iron alloy thin film, the method 20 including the steps of:

forming the first magnetic layer;

forming the gap layer on the first magnetic layer;  
forming the second magnetic layer on the gap layer; and  
forming the thin-film coil.

wherein at least either of the steps of forming the first  
magnetic layer and the second magnetic layer includes the step  
of forming the cobalt-nickel-iron alloy thin film through  
electroplating, the cobalt-nickel-iron alloy thin film  
containing 60 to 75 weight % cobalt, 10 to 20 weight % nickel,  
and 10 to 20 weight % iron, and having a crystal structure that  
is a mixture of a body-centered cubic structure phase and a  
face-centered cubic structure phase, in which  $I_b/I_f$  is in the  
range of 0.3 to 0.7 inclusive where  $I_b$  represents the intensity  
of an X-ray diffracted from a (110)-plane of the cubic-centered  
structure and  $I_f$  represents the intensity of an X-ray  
diffracted from a (111)-plane of the face-centered structure.

7. A method of manufacturing a thin-film magnetic head  
according to claim 6, wherein the pH of a plating bath for  
forming the cobalt-nickel-iron alloy thin film through  
electroplating is adjusted to 3.0 to 4.0 inclusive.

8. A method of manufacturing a thin-film magnetic head  
according to claim 7, wherein the value of  $I_b/I_f$  is controlled  
by controlling the pH of the plating bath.